THE RELATIVE TIME OF FERTILIZATION OF THE OVUM AND THE SEX RATIO AMONGST JEWS[1]

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IT has recently been shown[2] that in cattle the proportionate number of males born increases to a marked and statistically probably significant degree as the time of coitus becomes later and later in the œstrous period. Thus, putting all the available trustworthy data together, we have the following results:[3]

TABLE I

Showing the Sex Ratio in Relation to Time of Service

Time of Service	Sex of Young		♂♂ : 100 ♀♀
	♂	♀	
Early in heat	134	178	75.3
Middle of heat	67	58	115.5
Late in heat	77	44	175.0
Totals	278	280	....

It will be perceived that these figures, so far as they go, appear to give support to the theory of Thury[4] regarding sex determination. According to this theory ova which are at the time of fertilization over-ripe, or "stale," will give rise to a preponderant number of *male* young. If we may suppose, as there is some warrant for doing, that the ova fertilized late in heat are, in cattle, of a somewhat greater age (measured from the time of ovulation) than those fertilized early in heat, the results obtained accord fully with the theory. But leaving this point entirely out of account, the fact

[1] Papers from the Biological Laboratory of the Maine Agricultural Experiment Station, No. 48.

[2] Pearl, R., and Parshley, H. M., Data on Sex Determination in Cattle, *Biol. Bul.*, vol. XXIV, pp. 205–225, 1913.

[3] Loc. cit. p. 218.

[4] Thury, M., *Ueber das Gesetz der Erzeugung der Geschlechter bei den Pflanzen, den Thieren und dem Menschen*, Leipzig, 1864.

appears to be well established by the figures presented, that in cattle there is a definite relation between the proportion of the sexes born and the time at which the ova are fertilized with reference to the period of œstrus.

In his original publication Thury cited as evidence in support of his views the fact that statistics of sex show a relatively larger proportion of males to females among the Jews than in the general population of other races where they are living.

Thury's work has given rise to a number of references to the same phenomenon. Darwin,[1] quoting Thury,[2] expresses himself as much surprised at the figures given, and refers to those given for Prussia 113, Breslau 114, and Livonia 120, as compared with 104 for the non-Jewish populations.

Lagneau[3] considered the preponderance of males might be ascribed to the laws of separation practised by observant Jews, whilst Nagel[4] ascribes it to the greater care Jewish mothers take of their health, and the smaller number of illegitimate births amongst them, whilst others have ascribed it to the fact that Jews are essentially town dwellers and marry early. J. Jacobs[5] is inclined to regard the more striking differences as due to faulty statistics.

Fishberg[6] has recently discussed the problem afresh. Quoting Nichols[7] he states that whilst the sex ratio for seven million births in Europe generally is 1057 : 1000, the more southerly parts and the less cultured, such as Bulgaria, Greece, and Roumania, show a decidedly higher proportion of male births. In the Mussulman population of Algiers the proportion rises to 1191 : 1000.

These facts at once suggest that the proportion of males is

[1] Darwin, *Descent of Man*, 2d ed., p. 243.

[2] Thury, *La loi de production des sexes*, p. 25, 1863.

[3] Lagneau, *Du Denombrement de la Population de Paris*, 1882.

[4] Nagel, Der hohe Knabenüberschuss der Neugeborenen der Judinnen, *Statistische Monatschift*, p. 138, 1884.

[5] J. Jacobs, article "Births," *Jewish Encyclopædia*, vol. III, p. 225.

[6] Fishberg, The Jews: A Study of Race and Environment, *Contemporary Science*, 1911.

[7] Nichols, Numerical Proportion of Sexes at Birth, *Memoirs American Anthropol. Assn.*, vol. I, p. 247, Lancaster, Pa., 1907.

higher in those countries where the birth of a male child is valued over that of a female, and further suggest that the extraordinary ratios found are probably due to the negligence of parents in recording the births of their daughters. An analysis of the Jewish birth statistics in various Russian centers does much to confirm this view. In eastern Europe the midwives and rabbis are supposed to report the births to the authorities; now amongst Eastern Jews the birth of a son is welcomed with more enthusiasm than that of a daughter. Moreover the ceremony of circumcision and the consequent festivities are events which cannot be overlooked by the rabbis. In Russia there is a further reason for the greatest accuracy in the registration of the Jewish male births. As is well known, Jews in Russia are subjected to a system of persecution which reaches from birth to death. The Jew has at all times the greatest difficulty in acquiring a passport, but if in addition his registration is out of order and he is unable to prove his identity, his position is rendered so much the more precarious, while at the same time he lays himself open to all sorts of irregular demands on the part of the military officials. Fishberg is confident, and it would appear with good reason, that faulty registration is at the bottom of the anomalous Jewish birth ratio. Thus in 1893 the Jewish birth ratio was 1459 : 1000, but in 1901, when persecution was once more firmly established, the ratio was 1295 : 1000.

The comparison of birth ratios of neighboring places lends much strength to the same argument. Thus in 1897 the Russian-Jewish birth ratio was 1331 : 1000. But in detail it was most divergent. For Taurida the ratio was 1016, but in Wilna 1774 : 1000. Again, Courland and Wilna are close to one another, yet their ratios are 1154 and 1774 to 1000 respectively. Again, in Prussia, 1893–1902, where statistics are naturally more accurate, the proportion of males amongst Christians was 1059 : 1000, and amongst Jews 1062. In Austria in 1900 it was 1068 amongst Christians and 1078 amongst Jews. In both these cases the difference is minimum.

Fishberg remarks that if the number of male births (in Russia) was genuinely so greatly in excess of female, then one should expect a corresponding excess in the returns for children of one year of

age, but here we find for 1897 the ratio 1042 : 1000 given. The normal excess in the mortality of boys would not explain the great difference between this ratio and that given for the Jewish birth ratio, and one is forced to the conclusion that the data are untrustworthy.

Notwithstanding the probability that the statistics on which Thury and others have based their conclusions are at fault, the suggested explanation of Thury is of so much interest that it has seemed to us worthy of further investigation.

It will be remembered that Thury and Lagneau suggest that the separation (*niddah*) regulations of the Jewish women are the determining cause of the unequal sex ratio. These regulations are as follows: [1]

No connubial relations are allowed—

(*a*) For at least 24 hours before the expected catamenia.

(*b*) During the period—however transient the flow may be, it must for ritual purposes be considered as enduring at least 5 days.

(*c*) For a further period of 7 days from the 5th day after the commencement of the catamenia, or if it should continue longer than that period from the day on which every sign of discharge has disappeared.

These regulations are no doubt in a general way fairly faithfully followed amongst Eastern Jewesses, yet it is obvious that in mass statistics collected from the general Jewish population on the sex ratio one would not be warranted in assuming that the code given was universally or even generally applied.

To determine the influence of the sex ratio of the code, something more in the nature of an experiment was necessary. This, owing to the kindness of Rabbi Dayan [2] A. Feldman, B.A., we have been able to obtain. Dayan Feldman is intimately acquainted with the life of observant Jews in the east end of London and occupies a unique and honored position in London Jewry. He has compiled for us a list of the children of 57 families in which he

[1] *The Religious Duties of a Jewish Wife*, London, published by Jacob Dickson.

[2] A *dayan* is a Jewish ecclesiastical official who occupies a position which may be described as analogous to that of a judge and a bishop combined in one.

can with great confidence state that the laws of separation are strictly and consistently carried out in each case. Moreover in the great majority of the families here given the mothers are now beyond the child-bearing age. The parents of all the families enumerated here are Russians by birth, which renders the results obtained the more striking when one compares them with the Russian data already discussed.

In the following table we have, therefore, statistics which on the one hand are accurate, and on the other are capable of throwing definite light on the influence, if any, of the separation customs of the Jews on the sex ratio of birth:

TABLE II

Dayan A. Feldman's List of Families in which the Jewish Separation Customs are Strictly Adhered to

FAMILY	♂♂	♀♀	TOTAL CHILDREN	FAMILY	♂♂	♀♀	TOTAL CHILDREN
1	5	5	10	29	3	2	5
2	6	2	8	30	8	5	13
3	4	9	13	31	6	4	10
4	7	4	11	32	3	3	6
5	3	1	4	33	4	7	11
6	7	7	14	34	1	7	8
7	2	3	5	35	4	2	6
8	7	6	13	36	5	1	6
9	3	5	8	37	3	0	3
10	4	4	8	38	2	2	4
11	2	2	4	39	3	3	6
12	1	7	8	40	4	4	8
13	5	2	7	41	4	6	10
14	6	3	9	42	3	1	4
15	9	2	11	43	5	7	12
16	4	4	8	44	3	3	6
17	5	5	10	45	3	2	5
18	5	4	9	46	5	3	8
19	5	5	10	47	4	4	8
20	5	4	9	48	4	4	8
21	2	7	9	49	5	4	9
22	2	6	8	50	0	5	5
23	4	2	6	51	0	1	1
24	3	5	8	52	1	1	2
25	6	4	10	53	1	1	2
26	3	6	9	54	2	0	2
27	5	2	7	55	1	0	1
28	3	2	5	56	1	1	2
..	..	..	..	57	2	1	3
	Totals	.....	.....	.....	213	202	415

From this table the following points are clear:

1. The families are, with few exceptions, large. The mean number of children per family, including all families in the table, is 7.28. Leaving out of account the seven small families at the end of the table, the mean number of children per family is 8.04. The fact of such relatively high fecundity in these matings adds greatly to the value of the data.

2. There is no unusual or marked preponderance of male births in these families. Taking all 57 families the sex ratio is 1054 ♂ ♂ : 1000 ♀ ♀. Leaving out the seven small families at the end of the table, too small to be of any value in the present connection, the sex ratio is 1041 ♂ ♂ : 1000 ♀ ♀. These ratios do not significantly differ from each other, nor from the ratio for the general population of England of the same period.

In 1910 the Registrar's return gave a sex-ratio of 1040 ♂ ♂ : 1000 ♀ ♀.[1]

In the Census for 1911 the sex-ratio was 1041 ♂ ♂ : 1000 ♀ ♀,[2] whilst the children under one year are as 1022 to 1000.

While the numbers involved here are statistically small, they have some significance, we think, because of their accuracy respecting the point to be tested. If the time of fertilization of the egg relative to the menstrual period had any influence in the determination of sex or in the modification of the sex ratio (such as is observed in *general* Jewish statistics), this influence would certainly be expected to make itself apparent in the present data. The families are large, and the records partake more of the character of definite experimental records than of ordinary sex-ratio statistics. More accurate and precise data than these here given it will probably be impossible to obtain for man regarding this particular point under discussion.

One would seem justified in concluding that:

(*a*) *There is no evidence that in the human race the time of fertilization of the egg relative to the catamenial period has any influence on the sex-ratio exhibited by the offspring.*

[1] *Seventy-third Annual Report of the Registrar General of Births, Deaths and Marriages in England and Wales* (1910), published 1912, pp. xxiii.

[2] *Census of England and Wales*, 1911, vol. VII, pp. vi and xlix.

(*b*) *The higher male sex-ratio shown by the general Jewish statistics, if not entirely due to faulty registration, must owe its origin to other factors than the time of fertilization of the egg.*

The present results still leave entirely open the question of the metabolic condition (relative staleness, etc.) of the germ cells at the time of fertilization as a possible factor in the influencing of the sex-ratio in man.[1] The distribution of ovulation over the inter-menstrual period in the human female is so wide as to preclude any possibility of forming any judgment as to the relative age of discharged ova, on the basis of the time of menstruation.

[1] For discussion of this matter in other forms, see Pearl and Parshley, loc. cit.